



# The CDD (Common Data Dictionary) : A cross-domain repository of ISO & IEC ontologies along time

for  
“semantics and semantic interoperability” presentation

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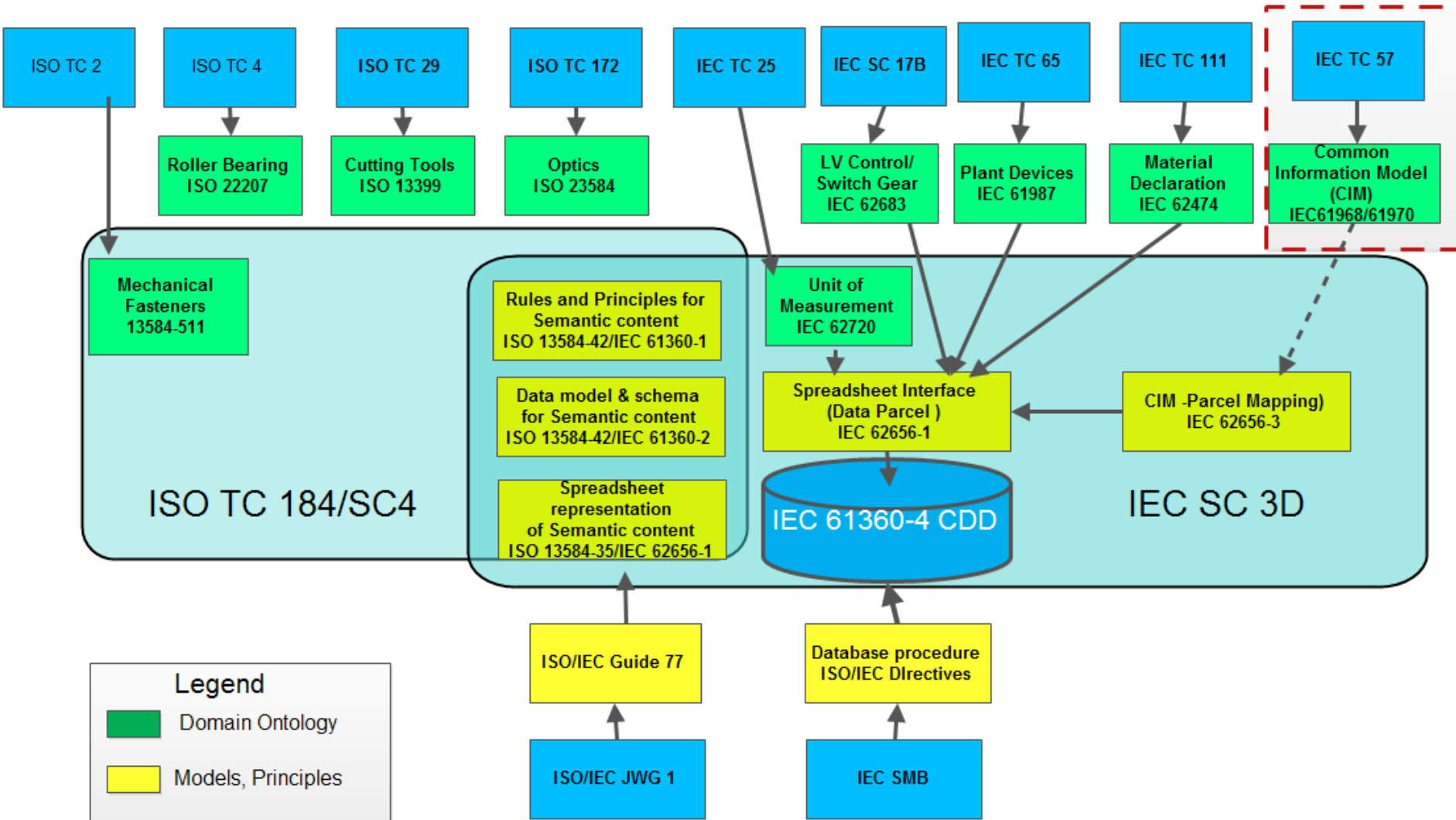
**Version 1.4, June 27, 2023**

# What is CDD ?

- CDD is a cross domain product ontology registry for both ISO and IEC products (including services). Namely, it is a database that **integrates and archives changes over time of ontologies** of different domains based on different ontology models, provided in multiple languages. (not a snapshot of things at a time, just as a file! )
- CDD is based on the common dictionary schema shared between ISO 13584-42 and IEC 61360-2, largely extended by 4-layer ontology-model & data interface defined in ISO 13584-35/ IEC 62656-1 standards, known as Parcellized Ontology Model (POM).
- It was agreed that CDD serves as the common repository for product ontologies based-on or transformable to ISO 13584-42 and IEC 61360-2 Common Data Dictionary Schema(CDDS).
- The updates of the CDD content are through Change Requests managed by database-based standardization procedures (ISO/IEC directive part 1, IEC supplement annex SK (The procedure for standards as databases), and ISO TC 184/SC 4 CSP (Committee Specific Procedure) for CDD.



# CDD is a result of collaboration with many TCs/ SCs in both ISO and IEC



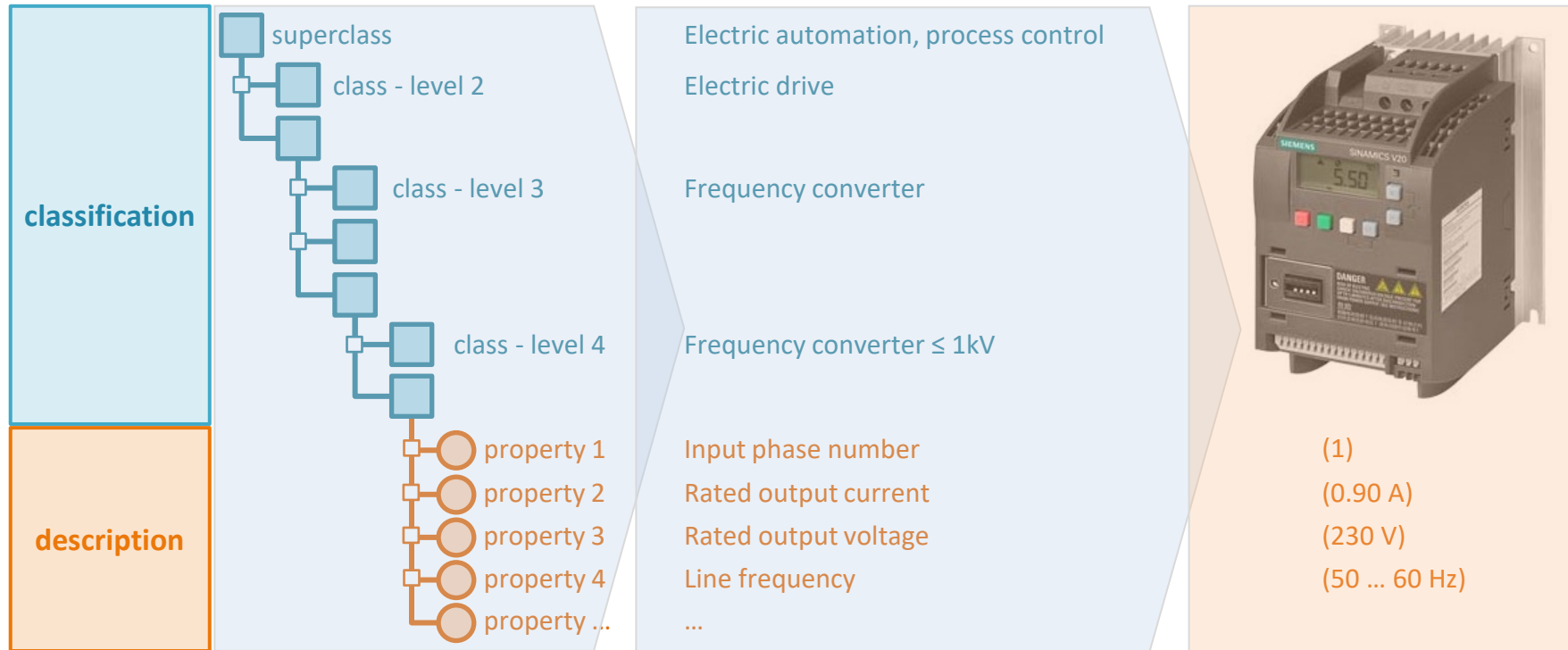
# Why is an information model according to IEC 61360 and ISO 13584-42 the preferred basis for SEMANTIC databases (IEC CDD, ECLASS, ...)?

The mission

The information model

The SEMANTIC database (IEC CDD, ECLASS)

The product description  
(an application using IEC CDD, ECLASS)





# How is an information model used for classification?

Example: Web shop

Web shops are early adopters and rely on standardized semantic data structures to reduce costs and resources for the preparation of data transmitted by the manufacturer of products

The screenshot shows a web shop interface for shoes. At the top, there are navigation tabs for 'WOMEN', 'MEN', and 'KIDS'. Below this is a main navigation bar with categories like 'Style Notes', 'New Arrivals', 'Clothing', 'Shoes', 'Sports', 'Accessories', 'Premium', 'Brands', and 'Sale'. A search bar is on the right. The main content area is titled 'Shoes' and features a large image of various shoe styles. Below this, there are three smaller images: 'STREET STYLE', 'CLASSIC', and 'TRENDY'. A sidebar on the left lists shoe categories: Ankle Boots, Boots, Trainers, Heels, Flats & Lace-Ups, Ballet Pumps, Outdoor Shoes, Flip Flops & Beach Shoes, Mules & Clogs, Sandals, Slippers, and Sports Shoes. At the bottom, there is a filter section titled 'Women's Shoes' with various dropdown menus for 'Brand', 'Colour', 'Price', 'Size', 'Material', 'Collection', 'New products', 'Discount', 'Pattern', 'Heel height', 'Type of heel', 'Toe', and 'Fastener'. The word 'units' is highlighted in green above the 'Size' dropdown, and 'values' is highlighted in grey above the 'Material' dropdown. The word 'properties' is written in blue at the bottom left of the filter section.



# (ISO/) IEC CDD online DB

IEC 61360 - Component Data Dictionary (CDD) - Mozilla Firefox

ファイル(E) 編集(E) 表示(V) 履歴(S) ブックマーク(B) GMarks(G) ツール(I) ヘルプ(H)

http://std.iec.ch/iec61360/iec61360.nsf/TreeFrameset?OpenFrameSe

IEC International Electrotechnical Commission  
IEC 61360 - Component Data Dictionary (CDD)

Home Classes Search

Domain: 1. IEC 61360-4

Open all | Close all

- 1. IEC 61360-4
  - AAA001 - Components
    - AAA002 - Electric/electronic components
      - AAA003 - Amplifiers
      - AAA013 - Antennas
      - AAA017 - Batteries
      - AAA020 - Capacitors
        - AAA021 - Fixed capacitors
          - AAA022 - Fixed air capacitors
          - AAA023 - Fixed ceramic capacitors
          - AAA026 - Fixed electrolytic capacitors
          - AAA027 - Fixed film capacitors
          - AAA028 - Fixed glass capacitors
          - AAA029 - Fixed mica capacitors
          - AAA030 - Fixed paper capacitors
          - AAA505 - Fixed mixed-dielectric capacitors
          - AAA031 - Variable capacitors

< > Print → Parcel

English French German Japanese

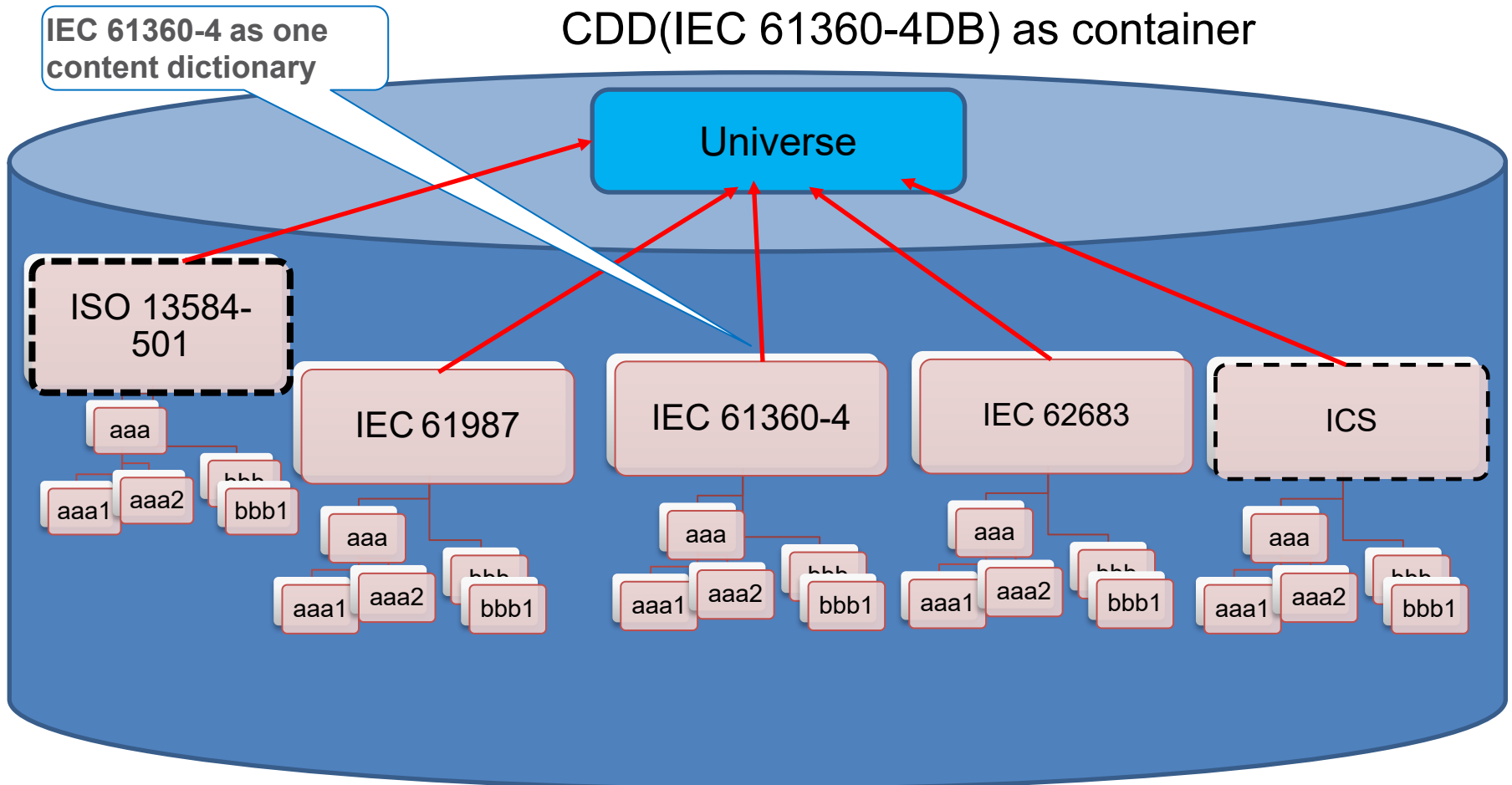
CLASS	
Code:	AAA031
Version:	001
Revision:	01
Preferred name:	Variable capacitors
Synonymous name:	variable
Short name:	
Coded name:	VAR
Definition:	A set of variable capacitors of which each capacitor can be described with the same group of data element types.

完了

# IEC 61360-4DB as container for standards and IEC 61360-4 as one content standard

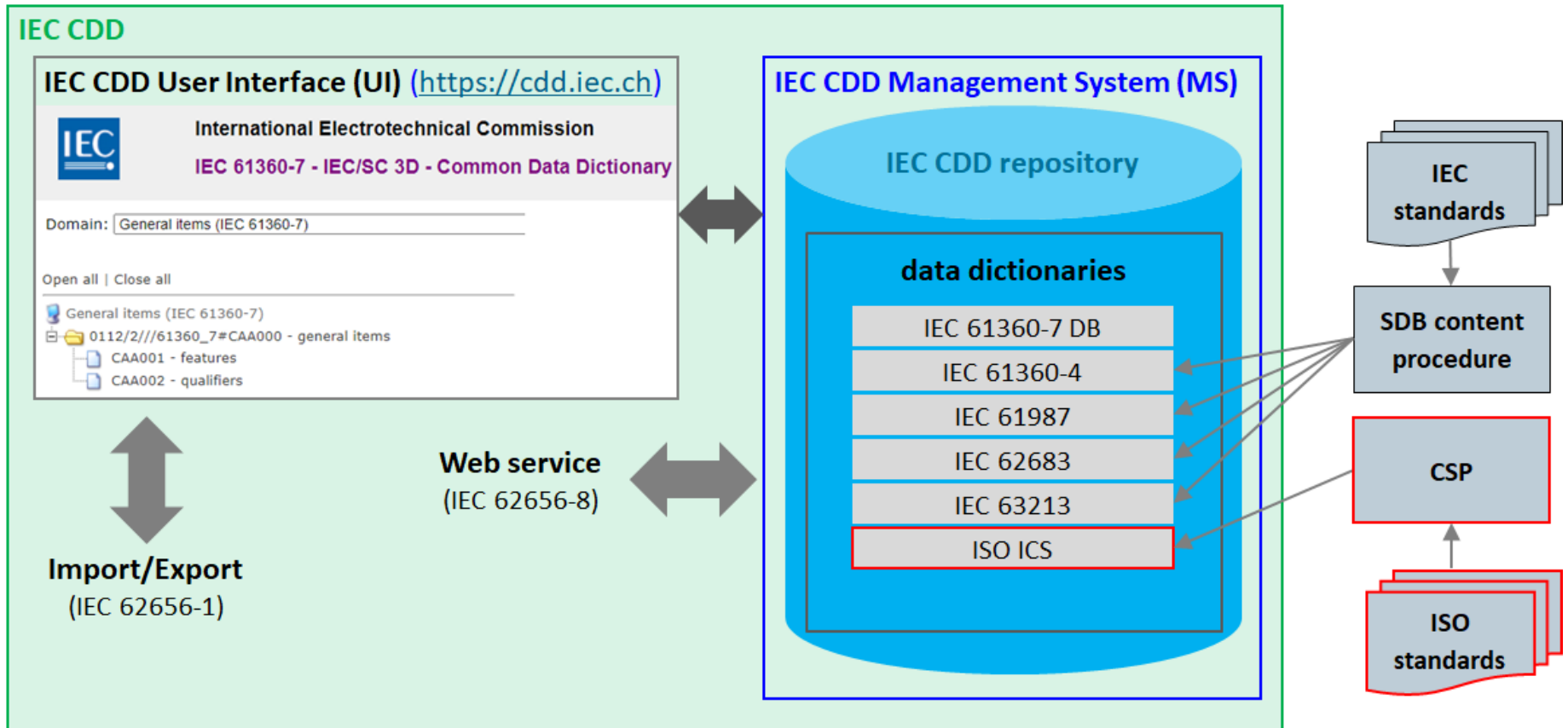
IEC CDD as a container

shall accommodate various ontology standards *as-is* with nominal syntactic translations without semantic change





## IEC CDD: Overview and terms



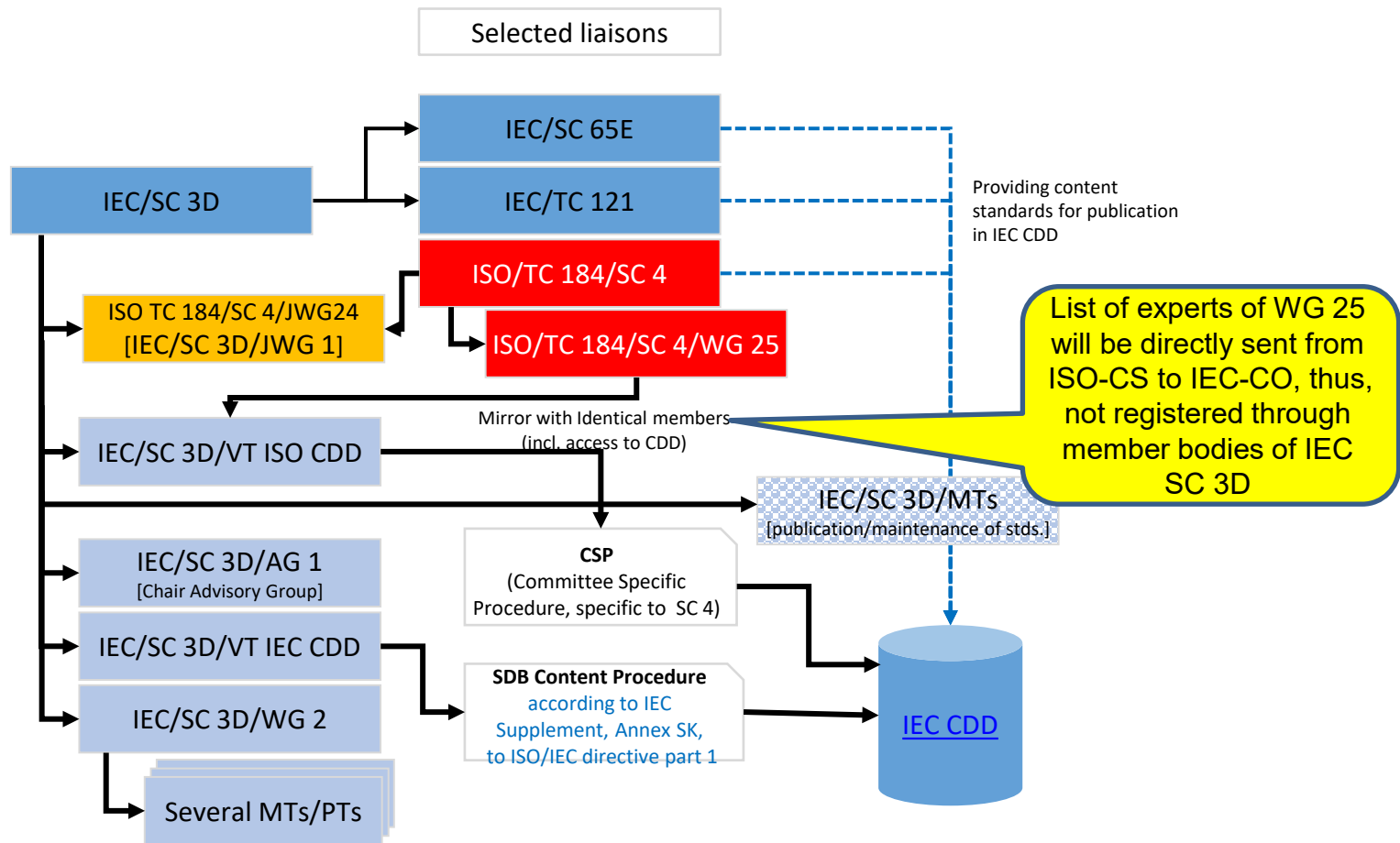


# How evaluation & validation are done

- For CDD since 2007, more than 120 change requests(CRs) have been processed, in each year about 10 to 20 CRs on average (except covid-19 years) .
- Change Requests are submitted in a bunch of Excel Sheets, defined in IEC 62656-1. Also, exchange formats in XML-Schema and JSON are available through IEC 62656-8.
- CRs to CDD from IEC TCs/SCs are evaluated and validated by VT-IEC-CDD under IEC SC 3D and CRs from ISO TCs/SCs are evaluated and validated by ISO TC 184/SC4/WG25, of which members are mirrored as VT-ISO-CDD under IEC SC 3D.

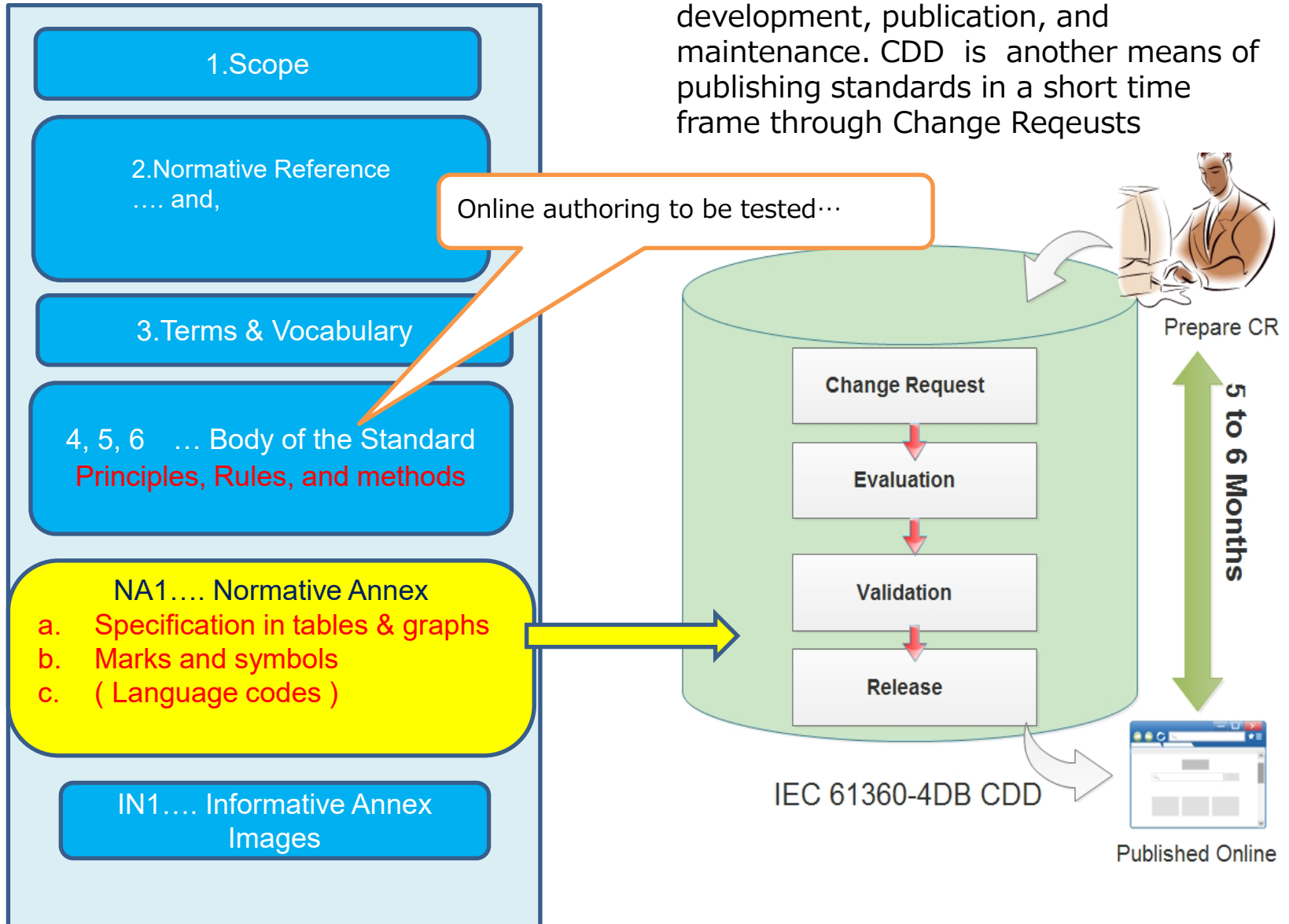


# ISO TC 184/SC4/ JWG 24 (+ WG 25) and IEC TC 3/ SC 3D work together to build and extend CDD.



# What possible with current CDD ?

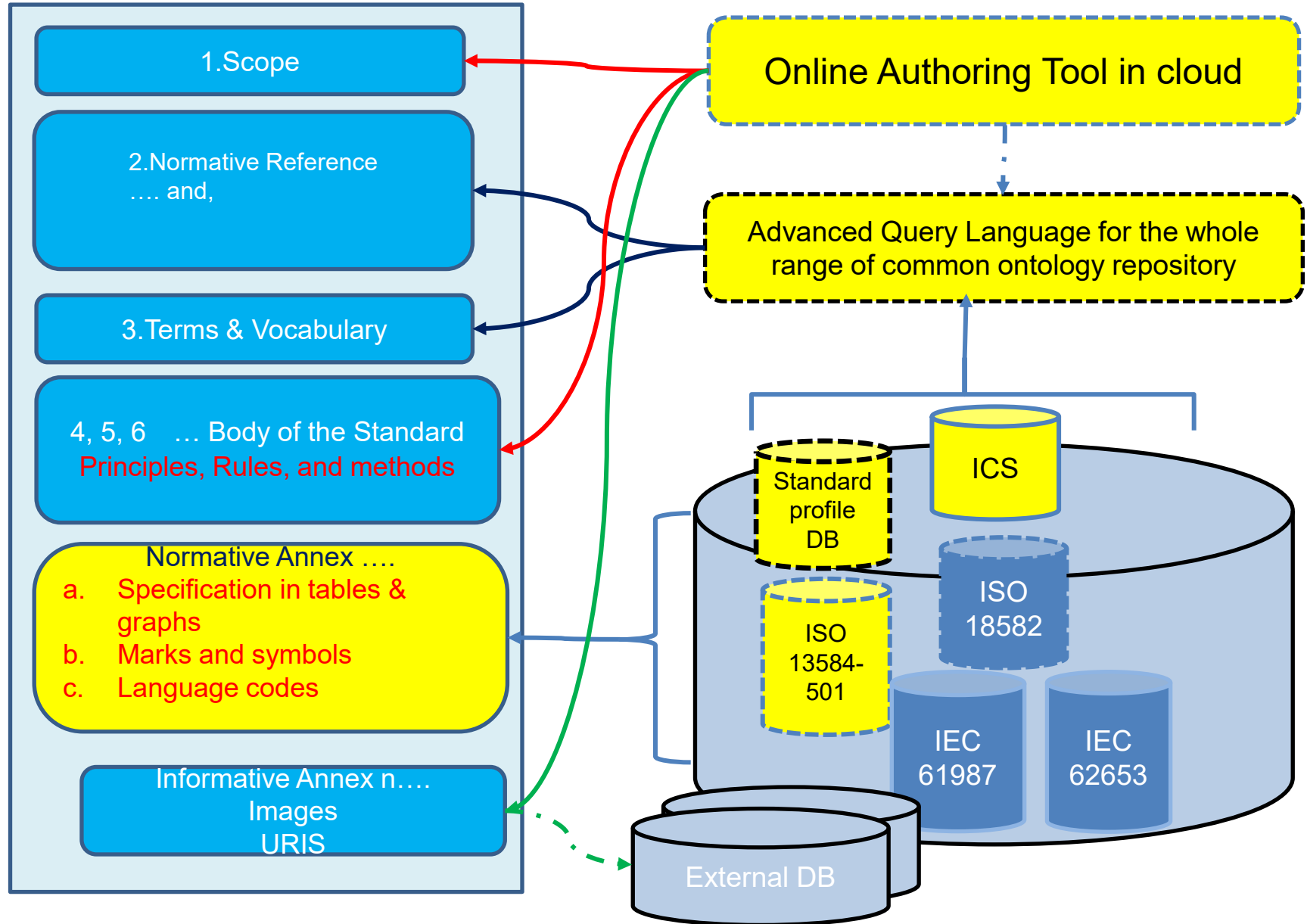
CSP for CDD to be used in standard development, publication, and maintenance. CDD is another means of publishing standards in a short time frame through Change Requests





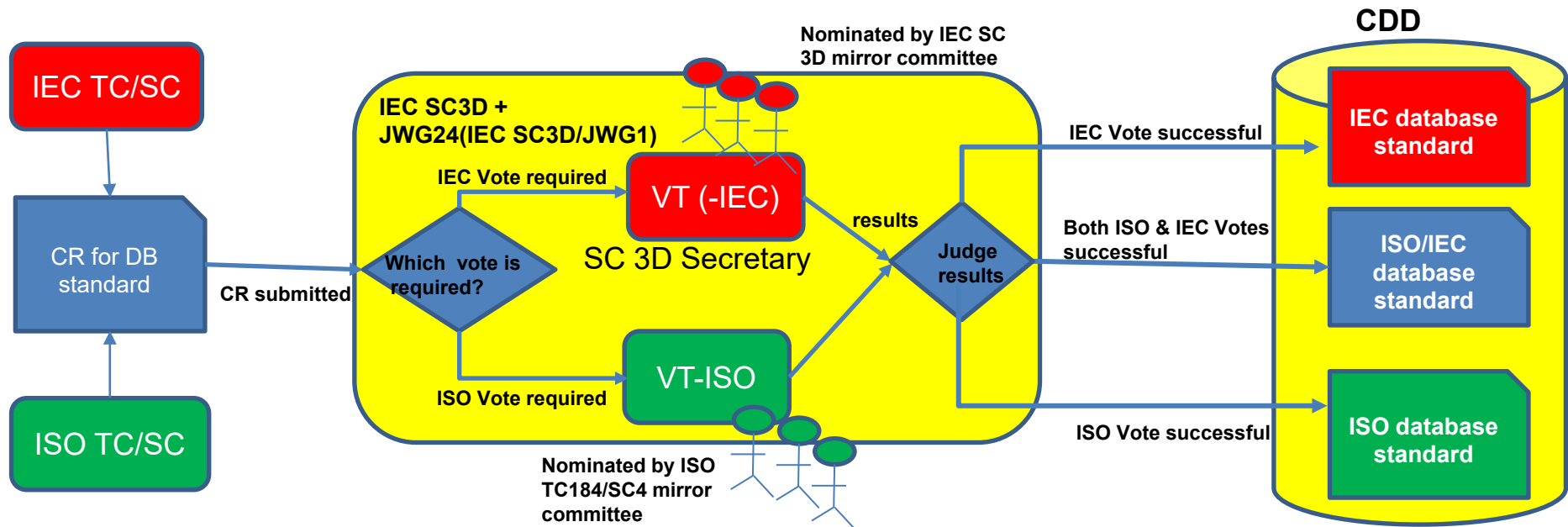
# Future use of ICS in CDD

All phases of standard development, maintenance, and application can be assisted by a smart interface associated with the ICS in CDD.



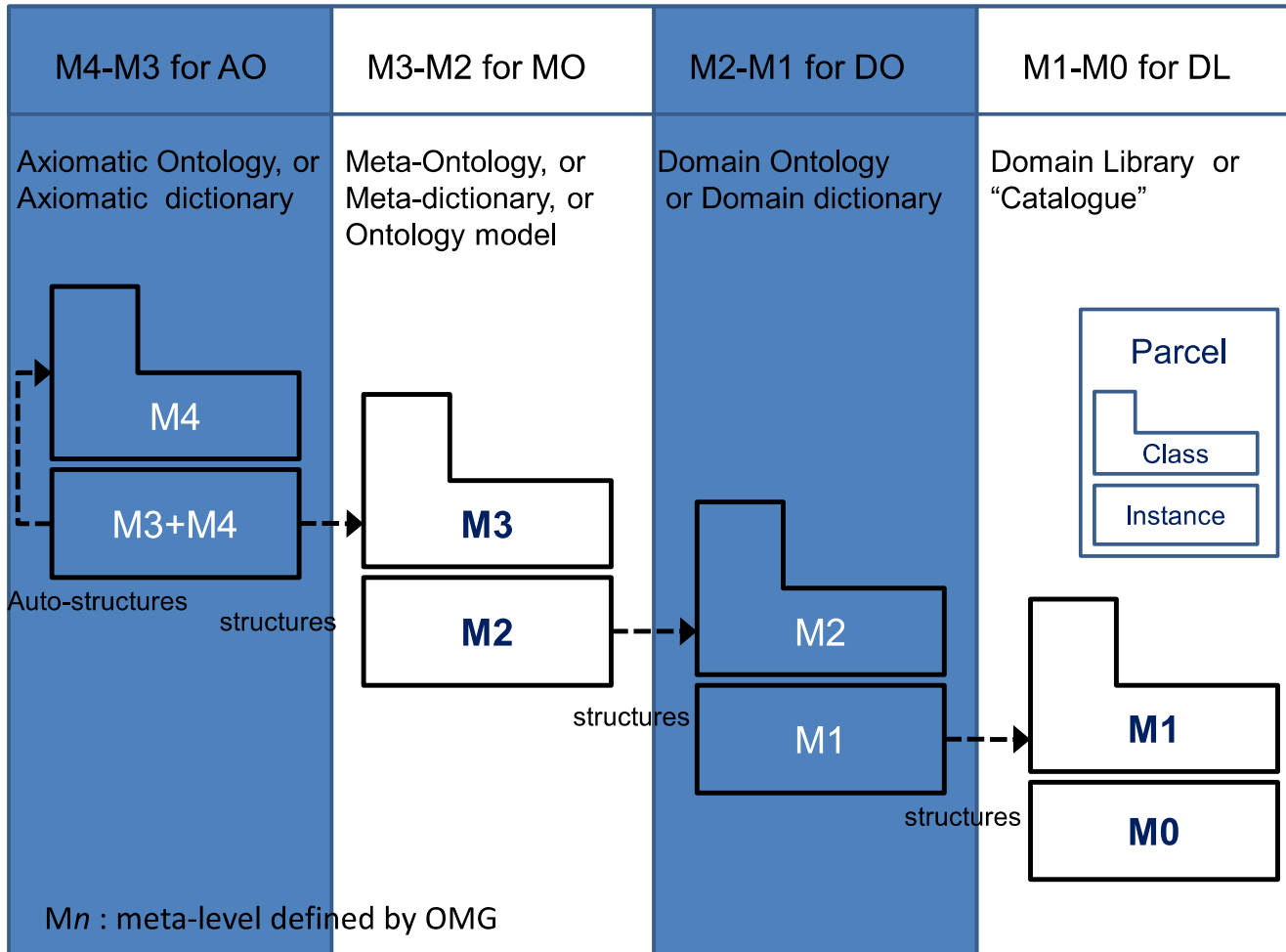
## For an ISO/IEC database-based standard, a CR shall be evaluated and voted twice by different sets of VT members in their roles (VT-IEC and VT-ISO).

- The physical persons nominated by a National Body of P-member country of ISO TC184/SC4 and IEC SC 3D could be identical, if the national mirror committees of both ISO TC184/SC4 and IEC SC3D choose to nominate the same person for their respective roles of VT-ISO and VT-IEC.
- But in general, managements in mirror committees of ISO TC 184/SC4 and IEC SC 3D are independent, thus different persons are assumed to be nominated from respective national mirror committees





- Layers of IEC 62656-1(ISO 13584-35) Ontology layers.

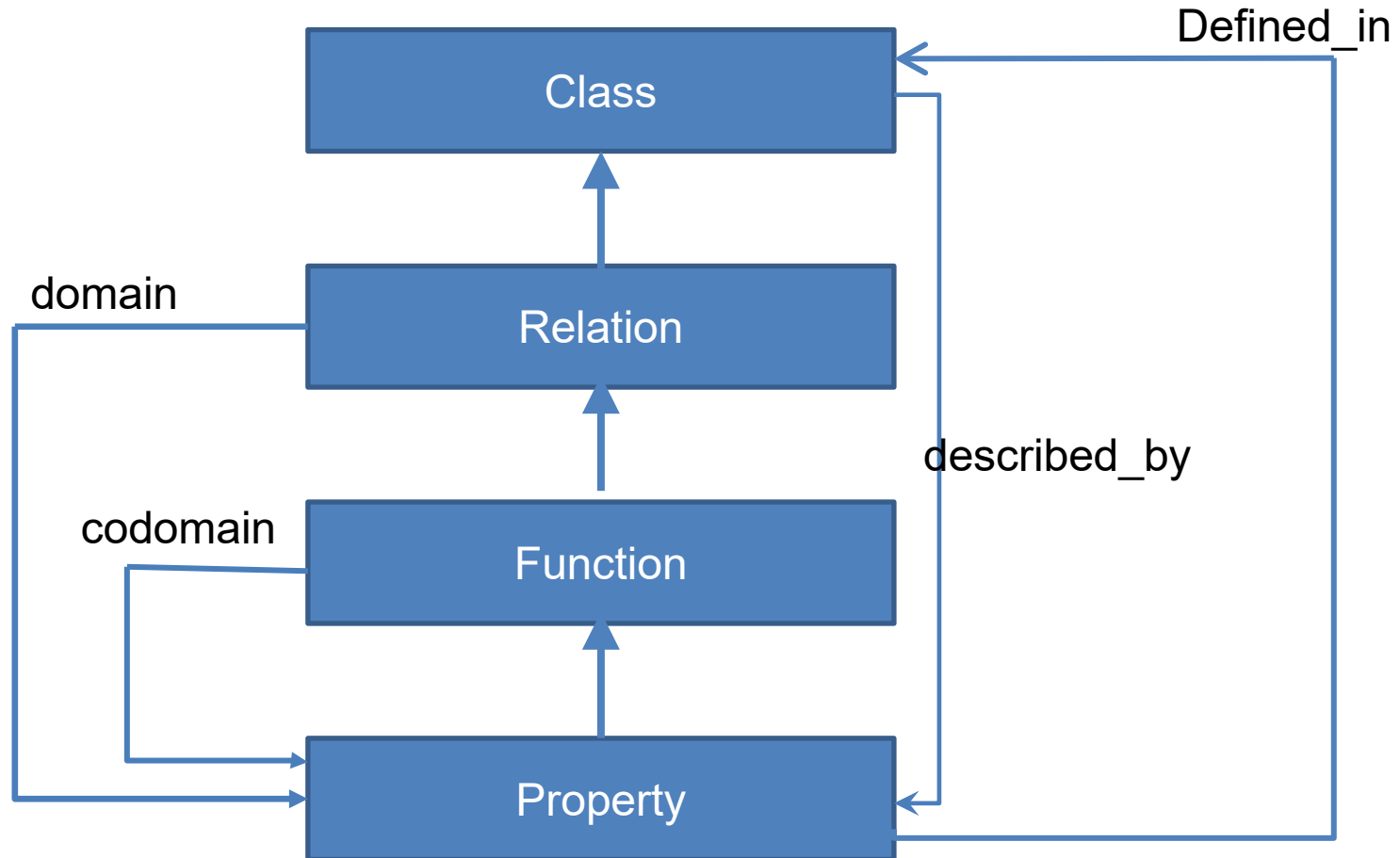


IEC

Figure 4 – Schematic diagram of Parcellized Ontology Model (POM)

# CDD on POM

All actual references are made through an identifier called IRDI::= RAI # DI #(#) VI, where RAI: Registration Authority Identifier, DI: Data Identifier, and VI: Version Identifier



Usually modelled as a unary-function  $p(x) = y$   
or  $P(x, y) = \text{True}$ ,  $x \in \text{Domain}$ ,  $y \in \text{Codomain}$



# CDD on POM

- Any concept is a class and a class is a concept. Property is a function, and function is a relation. Relation is a class, thus a property is a class. A constant, in other literatures individual is a property (or function) of arity zero, i.e., for  $\forall x, p(x) = y = c$ , or,  $P(x, c) = True$ . Thus it's a class, and is a concept.
- $C(x) = \{x \mid P_1(x, y_1), P_2(x, y_2), \dots, P_n(x, y_n)\}$  where  $P_i(x, y_i)$  is a  $i$ th-property about  $x$ , with its value  $y_i$  to make the  $i$ th-property True, provided properties are all intrinsic for the class.
- or simply, Class  $C(x) = \{x \in D \mid \wedge_i P_i(x, y_i)\}$ , where  $D$  stands for Domain of  $x$ .
- Note that  $P_i(x, y_i)$  does not necessarily mean a predicate described in a natural language. It could be a signal from a sensor or any other device that signifies true or false.
- JWG24 is considering the extension of the above logic toward the definition with probabilities. Namely,  
Definition of a probabilistic Class  $C$  of  $x$  is given by;  
$$C(x) = \{x \in D \mid z \leq \prod_i W_i \cdot P_i(x, y_i) \leq 1.0\},$$
where  $W_i$  is a weight on the property,  $P_i(x, y_i)$  returns not either True or False (1 or 0), but a range of discrete values from 0.0 to 1.0. and  $z$  is a threshold value for judging if  $x$  is likely a member of  $C$ .  
This way of extension will open a wide range of applications of the ontologies for AI.





## Predicate in a natural language sentence is not an atom in describing an ontology

- “A fly is on the ceiling.” in English cannot have a formal translation in Japanese, *is\_on* (X, Y) changes its meaning depending of Y . --- A concept needs to be translated into its equivalent with multiple properties, for certainty.
  - Literally “ue” ( 上 ) means “on” or “above” and “shita”( 下 ) means “under” or “below”, but if you see a fly is on the ceiling, in Japanese, it is shita (“under”) of the ceiling. So there is no one-to-one translation of the predicate in English into Japanese is possible. This means a predicate in natural language is not a universal atom for description of the concept.
  - Industrial product described in predicates in natural language alone has intrinsic problems in interoperability across languages of different origins.
- An octopus uses 2 halves of coconut shell to hide himself, where no language is used by the octopus, but he understands the concepts of both *is\_a* and *has\_a*.
- A bird picks a ripe berry from a tree. It differentiates a *part* from the *whole* and recognizes its colour without speaking or reading language.



# IEC CDD online

LINK: <https://cdd.iec.ch>

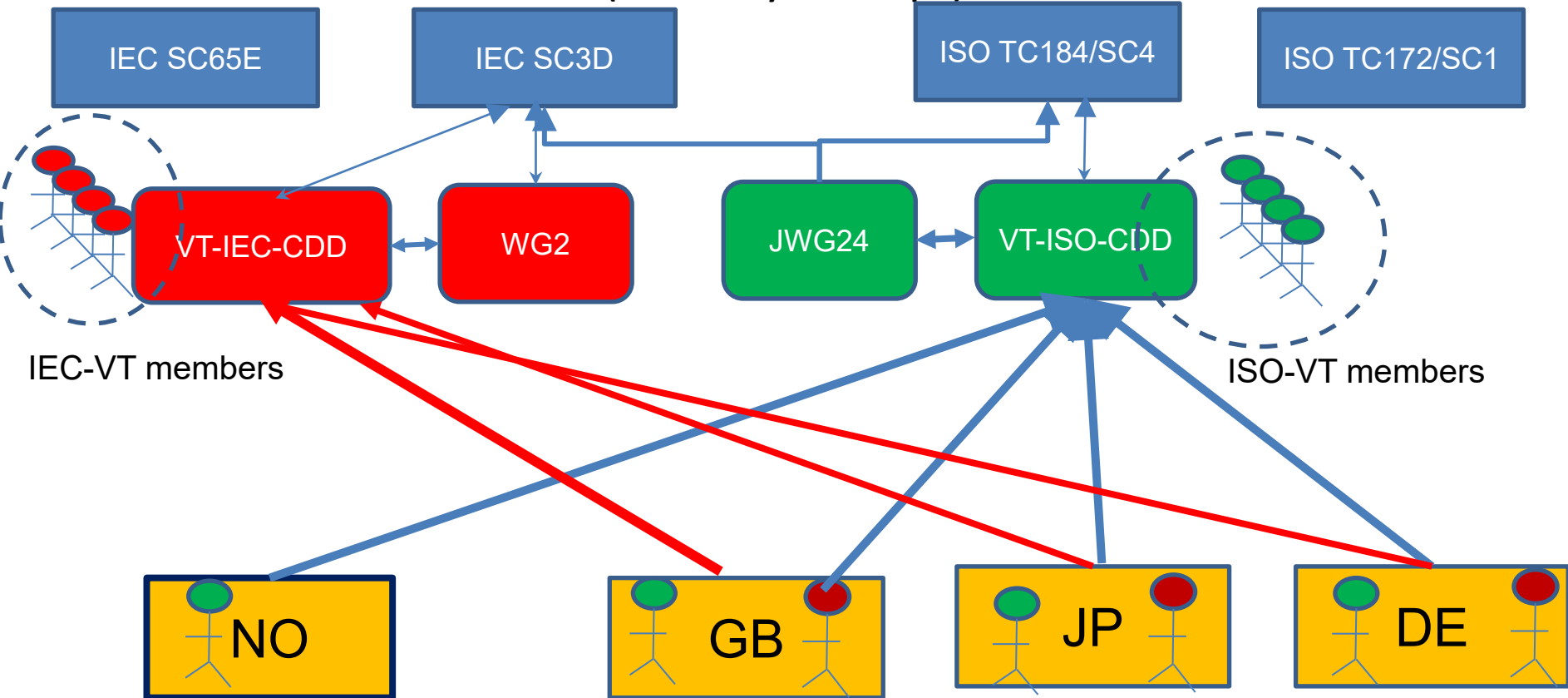


Thank you !

Some back up slides to follow.



Without VT-ISO-CDD, some P-members of ISO TC184/SC4 cannot participate in evaluation of CR nor execute votes through VT-IEC on CRs to CDD  
(See Norway for example)



Norway is not a P member of IEC SC 3D